PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY
(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION See Form PCT/IPEA/416	
P6384PC00/MLO		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/SE2004/001370	24-09-2004	25-09-2003
International Patent Classification (IPC) or national classification and IPC		
See Supplemental Box		
Applicant		
GAS TURBINE EFFICIENCY AB et al		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 4 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☒ *(sent to the applicant and to the International Bureau)* a total of 3 sheets, as follows:
      ☐ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s)) _____, containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).
4. This report contains indications relating to the following items:
   - ☒ Box No. I Basis of the report
   - ☐ Box No. II Priority
   - ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - ☐ Box No. IV Lack of unity of invention
   - ☒ Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability, citations and explanations supporting such statement
   - ☐ Box No. VI Certain documents cited
   - ☐ Box No. VII Certain defects in the international application
   - ☐ Box No. VIII Certain observations on the international application

Date of submission of the demand	Date of completion of this report
12.04.2005	08.12.2005
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. +46 8 667 72 88	Authorized officer Lars Hennix/MP Telephone No. +46 8 782 25 00

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/SE2004/001370

Box No. I Basis of the report

1. With regard to the language, this report is based on:

☒ the international application in the language in which it was filed

☐ a translation of the international application into _____ ,
which is the language of a translation furnished for the purposes of:

- ☐ international search (Rules 12.3(a) and 23.1(b))
- ☐ publication of the international application (Rule 12.4(a))
- ☐ international preliminary examination (Rules 55.2(a) and/or 55.3(a))

2. With regard to the elements of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):*

☐ the international application as originally filed/furnished

☒ the description:

pages 1-13 as originally filed/furnished
pages* _____ received by this Authority on _____
pages* _____ received by this Authority on _____

☒ the claims:

pages _____ as originally filed/furnished
pages* _____ as amended (together with any statement) under Article 19
pages* 14-16 received by this Authority on 2005-10-17
pages* _____ received by this Authority on _____

☒ the drawings:

pages 1-6 as originally filed/furnished
pages* _____ received by this Authority on _____
pages* _____ received by this Authority on _____

☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing *(specify)*: _____
- ☐ any table(s) related to the sequence listing *(specify)*: _____

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing *(specify)*: _____
- ☐ any table(s) related to the sequence listing *(specify)*: _____

* *If item 4 applies, some or all of those sheets may be marked "superseded."*

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/SE2004/001370

Box No. V **Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	1-16	YES
	Claims		NO
Inventive step (IS)	Claims	1-16	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-16	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

Amended claims 1-16 were field together with a statement on 2005-10-17

The following documents were cited in the International Search Report:

D1: US4415123 A1
D2: US5011540 A1
D3: US4196020 A1
D4: WO9214557 A1
D5: US5944483 A1
D6: JP9310625 A1

The cited documents represent the general state of the art. The invention defined in claims 1-16 is not disclosed by any of these documents.

The cited prior art does not give any indication that would lead a person skilled in the art to the claimed nozzle, the method for cleaning a gas turbine unit or the washing device for washing a gas turbine unit. Therefore, the claimed invention is not obvious to a person skilled in the art.

Accordingly, the invention defined in claims 1-16 is novel and is considered to involve an inventive step. The invention is industrially applicable.

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.
Continuation of: Cover sheet

INTERNATIONELL PATENTKLASSIFICERING (IPC):

B05B 7/08 (2006.01)
B08B 3/02 (2006.01)
F01D 25/00 (2006.01)

Amended Claims

2005-10-17

1. Nozzle for washing a gas turbine unit (1) arranged to atomize a wash liquid in the air stream in an air intake (2) of said gas turbine unit (1) comprising a nozzle body (40) comprising an intake end (41) for intake of said wash liquid and outlet end (55) for exit of said wash liquid, c h a r a c t e r i z e d in that a number of orifices (42, 46; 42, 46, 60) are connected to the outlet end (55) and in that respective orifice (42, 46; 42, 46, 60) is directed towards a centre axis (49) of said nozzle body (40) at a junction point (57) at a distance within a range of 5-30 cm from said orifice openings (43, 47; 43, 47, 61) and at an angle towards the centre axis (49) so that the liquid emanating from respective orifice opening (43, 47; 43, 47, 61) is within an angle range of 0-80°.

2. Nozzle according to claim 1, c h a r a c t e r i z e d in that each of said orifices (42, 46; 42, 46, 60) is arranged at substantially the same distance from said centre axis (49) and at substantially the same angle with respect to said axis that constitutes an extension of said centre axis (49).

3. Nozzle according to claim 1 or 2, c h a r a c t e r i z e d in that the liquid pressure in said orifices (42, 46; 42, 46, 60) is within the range of 35 – 175 bar.

4. Nozzle according to claim 3, c h a r a c t e r i z e d in that said orifice openings (43, 47; 43, 47, 61) are arranged to, in cooperation with said liquid pressure, cause said liquid to stream out with a liquid velocity in the range of 50 – 250 m/s.

5. Nozzle according to any one of preceding claims, c h a r a c t e r i z e d in that each of said orifice openings (43, 47; 43, 47, 61) has substantially the same design.

6. Nozzle according to any one of preceding claims, c h a r a c t e r i z e d in that said orifices (42, 46; 42, 46, 60) are arranged to form a spray into a form in accordance with any one of from the group of substantially circular, substantially elliptical or substantially rectangular.

7. Nozzle according to any one of preceding claims, c h a r a c t e r i z e d in that two orifices (42, 46) are connected to said outlet end.

8. Method for washing a gas turbine unit (1) comprising the step of atomizing a wash liquid in an air intake (2) of said gas turbine unit (1) by using a nozzle (54) comprising a nozzle body (40) comprising an intake end (41) for intake of said wash liquid and an outlet end (55) for exit of said wash liquid, c h a r a c t e r i z e d by the step of

producing said atomized wash liquid by delivering said liquid to a number of orifices (42, 46; 42, 46, 60) connected to said outlet end (55), wherein respective orifice (42, 46; 42, 46, 60) is directed towards a centre axis (49) of said nozzle body (40) at a junction point (57) at a distance within a range of 5-30 cm from said orifice openings (43, 47; 43, 47, 61) and at an angle towards the centre axis (49) so that the liquid emanating from respective orifice opening (43, 47; 43, 47, 61) is within an angle range of 0-80°.

9. Method according to claim 8, c h a r a c t e r i z e d by the step of directing the liquid emanating from the each of the orifices (42, 46; 42, 46, 60) against said axis that constitutes an extension of said centre axis (49) with substantially the same angle by arranging each of said orifices (42, 46; 42, 46, 60) at substantially the same distance from said centre axis (49) and at substantially the same angle with respect to said axis that constitutes an extension of said centre axis (49) and at substantially the same angle with respect to said axis that constitutes an extension of said centre axis (49).

10. Method according to any one of the claims 8 or 9, c h a r a c t e r i z e d in that the liquid pressure in said orifices (42, 46; 42, 46, 60) is within the range of 35 – 175 bar.

11. Method according to any one of the claims 8-10, c h a r a c t e r i z e d in that said orifice openings (43, 47; 43, 47, 61) are arranged to, in cooperation with said liquid pressure, cause said liquid to stream out with a liquid velocity in the range of 50 – 250 m/s.

12. Method according to any one of the claims 8-11, c h a r a c t e r i z e d in that each of said orifice openings (43, 47; 43, 47, 61) has substantially the same design.

13. Method according to any one of the claims 8-12, c h a r a c t e r i z e d in that said orifices (42, 46; 42, 46, 60) are arranged to form a spray into a form in accordance with any one of from the group of substantially circular, substantially elliptical or substantially rectangular.

14. Method according to any one of the claims 8-13, c h a r a c t e r i z e d in that two orifices (42, 46) are connected to said outlet end.

15. Washing device for washing a gas turbine unit (1) comprising at least one nozzle arranged to atomize a wash liquid in the air stream in an air intake (2) of said gas turbine unit (1) comprising a nozzle body (40) comprising an intake end (41) for intake of said wash liquid and outlet end (55) for exit of said wash liquid, c h a r a c t e r i z e d in that said at least one nozzle comprises a number of orifices (42, 46; 42, 46, 60) are connected to the outlet end (55) and in that respective orifice (42, 46; 42, 46, 60) is directed towards a centre axis (49) of said nozzle body (40) at a junction point (57) at a distance within a range of 5-30 cm from said orifice openings (43, 47; 43, 47, 61) and at an angle towards the centre axis (49) so that the liquid emanating from respective orifice opening (43, 47; 43, 47, 61) is within an angle range of 0-80°.

16. Washing device according to claim 15, comprising at least one nozzle according to any one of claims 2-7.